

## **DEVELOPING AN INSTRUCTIONAL MODEL IN AN INDUSTRIAL APPLICATION.**

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## **DEVELOPING AN INSTRUCTIONAL MODEL IN AN INDUSTRIAL APPLICATION.**

### **ABSTRACT**

Manufacturing needs a training model that identifies total job content, training methods to recognized substance and a process to continually upgrade the skill levels of the employees to meet and surpass the job requirements. This paper discusses an instructional development model in the role of determining entry skill levels, job content understanding, curriculum development, performance objectives and employee skill improvement.

### **THE NEED**

Manufacturing companies are beginning to understand the need for a highly skilled labor force that understands the detail tasks of the jobs they are required to perform. The constant pressures to maintain a profitable outcome along with the time required in converting raw materials to a finished product and the high costs of labor have limited the manager's ability to provide sufficient time for training. When time is allocated for training, the structure of the curriculum is limited to a general understanding of past experiences of senior employees performing what they perceive as the correct method. Lankard (1995) states:

In today's high performance organizations, workers must be prepared for continuous on-the-job growth and development. Given the increased age, variety of experiences, and diverse lifestyles and cultures of the working population, it is understandable that adult education practices must move beyond the traditional model of teachers as purveyors of knowledge and learners as passive recipients.

The advanced technology of the high volume, mass production type equipment has added to the traditional role of the front line supervisor as an on-the-job trainer. Hotek (2002) said: "It has been well established that an important skill of a supervisor is to appraise and improve the performance of his or her employees." (p. 70) First line supervisors are frustrated in their attempts to train qualified employees with antiquated methods of determining curriculum that fail to identify tasks necessary for the completion of the total job function.

This dilemma presents a two-fold problem. First, the trainer, the supervisor in this case, must develop a training program that covers every aspect of the job function. Second, the learner has to accept and apply the information the supervisor supplies in a meaningful learning experience. Taylor (1969) said that the term *learning experience* refers to "the interaction between the learner and the external conditions in the environment to which he can react. Learning takes place through the active behavior of the student; it is what he

does that he learns, not what the teacher does.” (p. 63) The obvious solution to this dilemma is to develop an instructional development model that will address the concerns of complete job descriptions and instructional technique. The intent of this paper is to present a development model that is based on years of research by men such as F.S. Keller, Robert Mager and Ralph Taylor. Their concepts will be used to build a development-training model that will give the supervisor a tool to provide systematic employee training that is consistent and cost effective.

### **THEORETICAL DISCUSSION OF MODEL DEVELOPMENT**

Tyler (1969) identified four fundamental concepts that must be utilized in developing any curriculum and strategy for instruction. The first is to identify the educational purpose or the skills that need to be learned or developed. The second is the interaction between the learner, the trainer and the environment in which the skills will be taught. The third is the interaction between learner, trainer and environment to organize the learning experience to provide the most effective use of time and facilities. The last is a measure of success to attain the desired results.

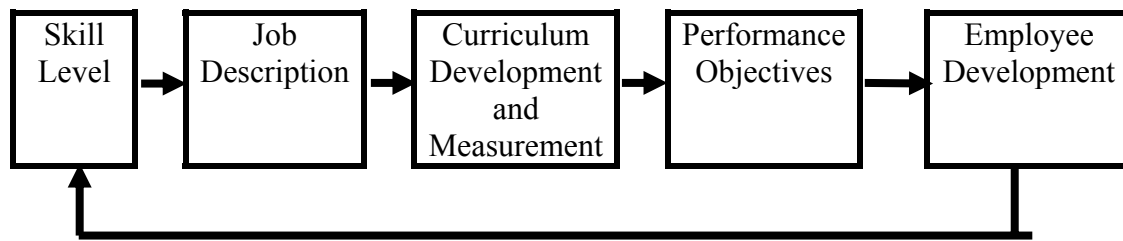
Mager and Beach (1967) expand on these concepts by discussing three phases of course development. The first is preparation phase to identify the job detail steps and determine prerequisite skills required to begin training. The second is development phase to determine the content, sequence and lesson plan for the identified job training requirements. The third is the improvement phase to compare the performance of the training to the objectives and provide feedback to improve the process.

Keller (1969) in his article “Good-bye Teacher.....” presented the concept that the learner have control of the pace and demonstrate the mastery of the material to a trainer as the learner progresses through the curriculum. The relationship between the instructor, trainer and learner is support, encouragement, and proven mastery of the required skills. The only criterion for completion of the curriculum rests on the learner and their desire to successfully complete the training task. Keller has demonstrated in his article the results of this type of self-directed training provided greater retention and mastery of the required skills.

The work of Tyler, Mager and Beach, and Keller was used to develop the five stages of the development model; skill level, job description, curriculum development, performance objectives, and employee development.

### **THE COMPOUND MAGNITUDE OF THE DEVELOPMENT MODEL**

The concept of a development model is to provide a step-by-step procedure to help the trainer and student identify what the job consists of in terms of tasks, performance and frequency. The model to be discussed involves detailed specifications for desired results in the areas of skill level, job description development, curriculum development and measurement, performance objectives, and employee development. Figure 1 illustrates the model concept.



**Figure 1. Instructional development model block diagram**

### **Skill Level**

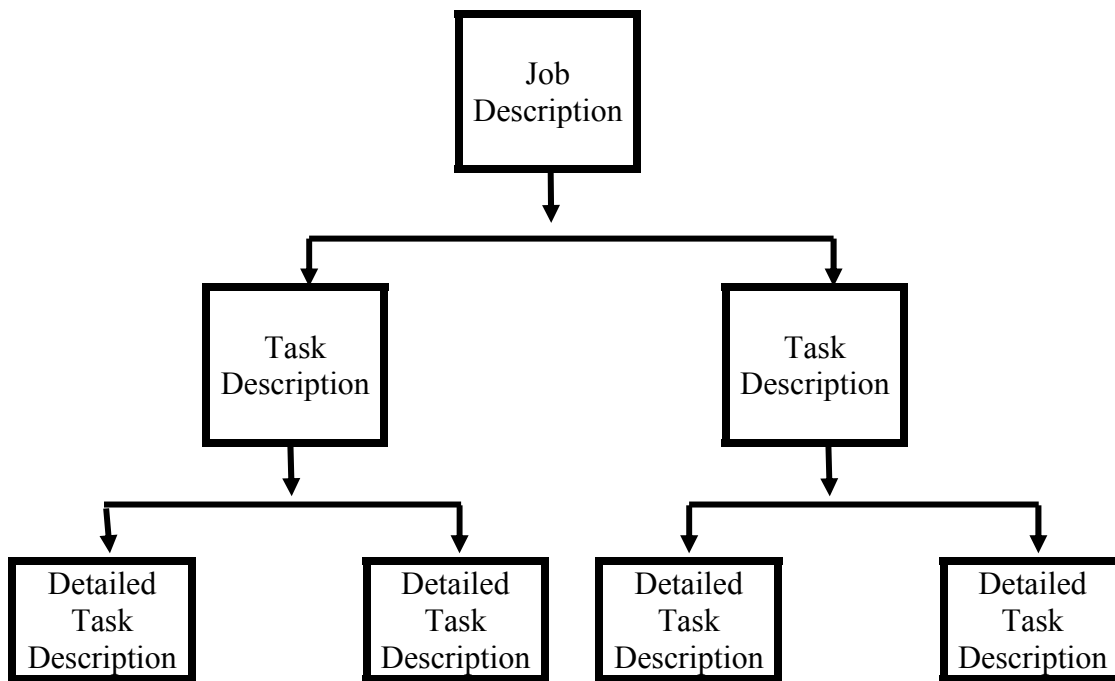
The Secretary's Commission on Achieving Necessary Skills (SCANS) Report (United States Department of Labor, 1991) was written to identify work skills required of schools and identified a three-part foundation for defining the minimum levels of proficiency for workers to effectively perform in an industrial environment. One of those foundations identified was basic skill of reading, writing, arithmetic, listening, and speaking.

Job performance requires the individual to be able to communicate with their fellow worker, articulate one's own point of view, decision making based on calculated facts and interpersonal dealings with other workers doing similar jobs. Identifying the basic skill levels of job performance is the first step in this development model.

WorkKeys (2004) is a system that identifies the skill levels of employees by testing knowledge in subjects like reading, mathematics, finding material, teamwork and observation. Identifying the minimum skill level for specific core functions during the development of the job description will provide the entry-level requirements for identified skills. WorkKeys can test entry-level employees for required skills and provide remediation training to improve the skills of employees who test below the standard.

### **Job Description**

The job description process involves three functions, writing a job description, identifying job tasks, and listing detail job tasks. The job description is a general account of what the person does, at what frequency, in what environment and at what level of skill performance. Once the job description (summary) is written, the job can be divided into tasks that identify the content of the job description. After the tasks descriptions have been identified, each task can be divided into detail task steps that describe the specific functions in detail. Figure 2 illustrates the job description concept at the minimal level but can be expanded to include as many task descriptions as necessary to explain the job description. Tasks descriptions and detailed tasks can be added as needed.



**Figure 2. Block diagram of job description process**

Mager and Beach (1967) said, “The strategy of developing effective instruction then, is one that calls for performance orientation rather than subject matter orientation. The strategy is to use the job as the basis for deciding what will be taught and in what order and depth, rather than simply to present as much subject matter as possible in the allotted time.” (p. 3) The process to identify or describe the job begins with a general description that presents a general summary of the overall function of the job. The job description should list what is actually being performed not what should be performed or what the employee knows. A job description is usually a paragraph in length.

The intent of the task description is to capture the divisions or categories that describe the structure of the job description. A good rule to verify the validity of the task descriptions is to check to see if every aspect of the job description structure is being identified by the task descriptions. In other words, does the task description “stand alone” and contradict the other task descriptions or do they complement and add to each other to form a cohesive summation of the content of the job description?

According to Mager and Beach (1967), there are three areas that need to be identified with task listings in the task description:

1. the frequency or repetition of tasks,
2. the importance of the task in relation to job function, and
3. the task learning difficulty.

Each has a rating scale that identifies the degree of difficulty or repetition. Figure 3 is a Task Analysis work sheet, which describes the task. The task from the job description will be listed under the task column.

NUMBER	Task Listing	WORK KEYS						
		FREQUENCY	IMPORTANCE	LEARNING	MATH	LOCATING	TEAMWORK	OBSERVATION
	Description: List the Tasks from the Job Description.							
1	List the first individual task from the Job Description	1	5	1	3	4	4	5
2	List the second individual task from the Job Description	2	3	2	3	4	4	4

#### Frequency

1	Everyday
2	Continuously
3	Moderate
4	Once in a while
5	Very rarely

#### Importance

1	Very low
2	Medium low
3	Medium
4	Medium to high
5	High

#### Learning Difficulty

1	Extremely easy
2	Moderately easy
3	Moderate
4	Moderate to difficult
5	Difficult

**Figure 3. Task analysis work sheet**

The first column after the task description is the frequency of performance, which is a measure of how often the detail task is performed, everyday, continuously, once in a while or very rarely. The frequency helps to develop the curriculum, skill level and possible time spent in training certain task descriptions.

The next column is the importance of the task and the rating helps to identify the relationship of the detail task function to the overall rationale of the other detail tasks. One detail task may have a frequency of continuous but have an importance rating of 1 or very low. Other detail tasks could have a frequency of once in a while but have a high importance of 5.

The fourth column defines the learning difficulty from easy to difficult. The Work Keys area defines the skill levels that each task must demonstrate in order to perform that function. The Work Keys scores reflect the relationship of the task to the previously defined task frequency, task importance and task learning difficulty.

When the task analysis work sheet is completed, the next step is to identify one task and break down the task into detail steps. Figure 4 is the Detail Task Analysis work sheet and is very similar to the Task Analysis work sheet. The only difference is an extra column that lists a Work Instruction document number. The intent is to recognize each detail step within the specific task and identify the relevant information that can be used for training and curriculum development.

### CURRICULUM DEVELOPMENT AND MEASUREMENT

The emphasis of the curriculum development and measurement phase is to identify each detailed task description and allow each student to be able to do something that he could not have done at the start of the exercise. Curriculum can be based on computer-assisted instruction (CAI), paper and pencil exams, or performance drills to measure the ability of the student to perform hands-on work with actual equipment.

	Detail Task Listing									WORK KEYS
NUMBER	Description: List one of the Task identified on the Task Analysis Work Sheet	WORK INSTRUCTIONS NUMBER	FREQUENCY	IMPORTANCE	LEARNING	MATH	LOCATING	TEAMWORK	OBSERVATION	READING
1	List the first detail task									
2	List the second detail task									
3	List the third detail task									
4	List the fourth detail task									
5	List the fifth detail task.									

#### Frequency

1	Everyday
2	Continuously
3	Moderate
4	Once in a while
5	Very rarely

#### Importance

1	Very low
2	Medium low
3	Medium
4	Medium to High
5	High

#### Learning Difficulty

1	Extremely easy
2	moderately easy
3	Moderate
4	Moderate to difficult
5	Difficult

**Figure 4. Detail task analysis work sheet**

### Performance Objectives

The performance objectives of the model are to present the student with a system to provide learning opportunity, positive reinforcement for the work done properly, and corrective reinforcement for inappropriate responses. Keller (1967) has described several

steps that can be used to present the materials to students and measure the mastery of the material.

The first is allowing the student to work at their own pace within a general time frame to complete the materials assigned. This permits the student to move through the course based on his ability to devote time to the material and also comply with other demands to his time.

The second is the student can only progress through the material and move on to the next section when they have demonstrated mastery of that material. Reinforcement has to be immediate after completion of each detailed task assignment to help the student retain the materials.

The last is the use of a trainer or proctor, which permits repeated testing, instant feedback on incorrect answers, inescapable tutoring, and a personal social relationship to the trainer.

Upon completion of a predetermined sequence of detail task mastery, the student will perform a demonstration of the learned skills to a panel of trainers, supervisors or employees who have demonstrated their mastery of the topics. This performance test will determine their capacity to be certified at the detail task mastery level. The panel will use a checklist to rate the performance of the student and either pass or fail the results. The student cannot proceed until mastery has been proven and once proven, they move on to the next detailed task.

## **EMPLOYEE DEVELOPMENT**

The last area is employee development and two avenues can be followed. The first is to measure the effectiveness of the training on the student through questionnaires surveys or job interviews. The results of the data can be used to up-grade the training program and identify fallacies in the process or curriculum. The second area deals with the skill level of the student and an attempt to elevate those skills to a higher level. The most obvious method of accomplishing this task is to consider the entry skill level requirement and determine the degree of adjustment that would benefit the overall job performance.

When the employee is certified for a specific job description, they will be given a performance improvement time line that identifies key areas, which have to be accomplished within the specified time. For example; an employee may have an entry skill level of 3 for reading but after two years that level goes to 4 and at four years goes to 5. This can also be incorporated into the technical aspect of the job description with certain tasks defined as obtaining assistance from a technician. The time line may specify that after four years, the employee perform the task without the technician. This may require the employee to develop skills outside of their job description.



## **DISCUSSION**

The intent of this model is based on proven research of development models and the focus is to provide life-long-learning. The employee training in manufacturing was once an operator was trained, they were trained forever. Only equipment or process changes required re-training of the employee.

This model provides an opportunity for the employee to improve their skill levels from year to year so that in future years, the employee will have a broader understanding of the process and will be of more value to the company. Continuous improvements will make the job description outdated and will have to be re-written to upgrade the skills of the new process and operator, thus creating a continuous loop of improvement to keep pace with an ever changing market place.

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